FLUKE®

Instruction Sheet

80i-410
DC/AC Current Probe

Operating Temperature: 0 to 50°C (32 to 122°F)

Storage Temperature: -40 to 60°C (-40 to 140°F)

Relative Humidity: 0 to 90% (0 to 35°C)
0 to 70% (35 to 50°C)

Batteries:
QUANTITY/TYPE: two 1.5V AAA
LIFE: 600 hrs typical
LOW INDICATION: Output voltage is between 0.0 and -99.9 mV with the power switch off (load impedance >1 MΩ)

Safety: Protection Class II as defined in IEC 348 and ANSI C39.5

VOLTMETER COMPATIBILITY

The 80i-410 DC/AC Current Probe is compatible with any voltmeter, multimeter, or other voltage-measuring instrument that has the following features:

- Input jacks that accept Fluke safety-designed shrouded banana plugs.
- Range and resolution capable of displaying 1 mV of output per amp of measured current.
- Voltmeter accuracy (uncertainty) of 0.75% or better to take full advantage of the accuracy of the probe.
- Input impedance of 1 MΩ, 100 pF or greater. (See the Load Impedance specifications for operation with lower impedance instruments.)

When the probe is making a measurement, the current-carrying conductor is not broken and remains electrically isolated from the probe's output. As a result, the probe's output common may be either floated (isolated) or grounded.

BATTERY INSTALLATION

The 80i-410 DC/AC Current Probe requires two 1.5V, AAA size batteries for operation. Install the batteries as follows:

1. Use your thumbnail to raise the latch and open the battery compartment (see Figure 1).
2. Observe the polarity markings on the inside of the battery door. Note that the polarity for each battery is the reverse of the other.
3. Install the batteries so that the polarity markings on the batteries match the markings on the battery door.
4. Snap the battery door shut.

NOTE

If both batteries are not installed with the correct polarity, the battery test may indicate that the batteries are good, but the probe will not operate.

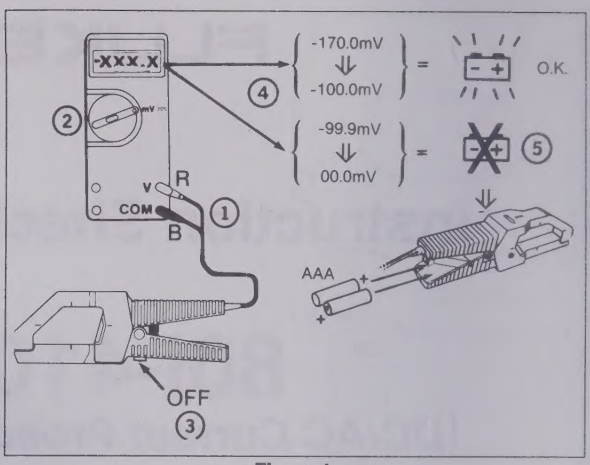


Figure 1.

OPERATION

Battery Test

Use the following procedure to test the batteries:

1. Connect the probe output leads to the voltmeter inputs: black to COMMON or LOW, and red to VOLTS. (See Figure 1.)
2. Set the voltmeter function to dc millivolts (dc mV ⎓), and turn the voltmeter power on. Select a range capable of displaying 170 mV dc.
3. Verify that the power switch on the probe is in the OFF position.
4. Observe the voltmeter reading. If the reading falls between -100.0 and -170.0 mV, the probe is ready for use. (New batteries should read approximately -150 mV.)
5. If the reading falls between 0.0 and -99.9 mV, both batteries should be replaced. If the voltmeter reading is positive, either the test leads are reversed or the batteries are installed incorrectly.

Demagnetizing

When the 80i-410 DC/AC Current Probe has been used for a current measurement and then removed from the conductor, a small amount of residual magnetism often remains in the core. This residual magnetism will generate a dc offset at the probe output. In other words, the voltmeter will show a small dc reading even though there is no current passing through the jaws of the probe. The residual magnetism should not cause a problem for ac current measurement because the ac voltage function in most multimeters is ac coupled; therefore, the dc offset will not be displayed. However, for dc current measurements, the dc offset caused by the residual magnetism will contribute to reading errors. The residual magnetism can be minimized as follows (see Figure 2):

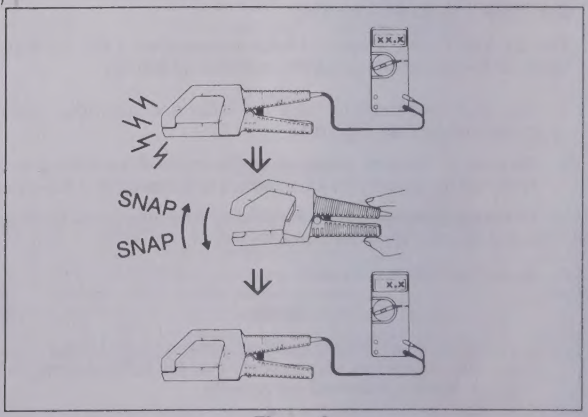


Figure 2.

1. Use the thumb and forefinger of one hand to grasp the probe in the middle where the two screw heads are exposed.
2. With your other hand, compress the handles together, then release them suddenly. The jaws should come together with a snapping action.
3. Repeat the above procedure twice.

NOTE

The snapping action will not damage the jaws if the mating surfaces are kept clean.

Alternate Demagnetizing Procedures

If a conductor carrying ac current is available, clamp the jaws of the probe around the conductor, wait a few seconds, then slowly remove the probe. If a conductor carrying dc current is available, clamp the jaws of the probe around the conductor. Then remove the probe and clamp it around the conductor again so that the current flows through the jaws in the opposite direction.

Making Measurements

Use the following procedure to make current measurements (see Figure 3):

1. Connect the probe output leads to the voltmeter inputs (black to COMMON or LOW and red to VOLTS).

NOTE

Refer to Table 1 to determine the appropriate input jack and proper function setting for use with a Fluke handheld DMM.

2. Select the appropriate ac or dc function on the voltmeter.
3. Turn on the voltmeter and select a voltage range to display the expected value (1 mV per amp).

NOTE

When measuring ac current, and using a meter without an ac mV function, use the ac Volt function. With many meters, this will limit resolution to 1A and readings will appear divided by 1000. For example, a 15A reading will appear as 0.015V.

4. Turn the probe ON/OFF switch located on the probe handle to the ON position.
5. Observe the voltmeter reading. If necessary, demagnetize the probe.
6. Clamp the jaws of the probe around the conductor to be measured. Position the probe so that the conductor is in the center of the jaw opening for the most accurate reading.
7. Observe the voltmeter display. The reading in millivolts is equivalent to the current in amps (i.e., 5 mV = 5A). A positive polarity reading indicates that the dc current is flowing in the direction of the arrow on the probe.
8. Snap the jaws twice to remove the residual magnetism in the core (see Demagnetizing and Alternate Demagnetizing Procedures). Do NOT turn the gain adjustment to eliminate core magnetism. If the core magnetism persists after demagnetizing procedures have been completed, perform steps 1-6 of the Calibration Procedure.

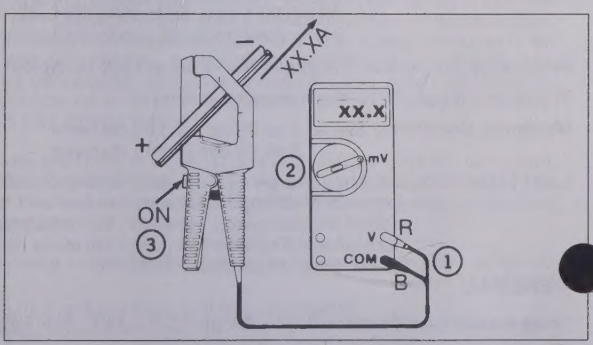


Figure 3.

Table 1. Clamp/Meter Setup Guide

FLUKE MODEL	INPUT JACK (for red lead)	FUNCTION
10,11,12	+	4000 mV ac or dc ***
21, 23, 21 Series II, 23 Series II	V Ω →|←	300 mV dc or Vac*
25,27	V Ω →|←	mV dc or ac
70	V Ω →|←	300 mV dc or Vac*
73, 73 Series II	V Ω →|←	300 mV dc or Vac*
75,77, 75 Series II, 77 Series II	V Ω →|←	300 mV dc or Vac*
78	V Ω →|←	400 mV dc or Vac*
29,79 Series II	V Ω →|←	mV dc or Vac
83,85,87,88	V Ω →|←	mV dc or Vac
8060A,8062A	V Ω or V Ω S	V dc or ac**
8020A,8020B, 8021B,8022A, 8024A,8024B, 8026B	V Ω or V Ω S	V dc or ac**

*Limited to 1A resolution for ac current
**200mV range for up to 200A, 2V range for up to 1000A
***Limited to 1A resolution for ac or dc current

Low Level Measurement

The 80i-410 DC/AC Current Probe is specified to measure currents of 5A or greater. Currents below 5A can be accurately measured by looping the input wire through the jaws of the probe so that the sum of the amp-turns through the jaws is greater than 5A. The actual current can then be calculated by dividing the meter reading by the number of turns looped through the jaws.

TROUBLESHOOTING

If the 80i-410 DC/AC Current Probe does not perform properly, use the following steps to help isolate the problem:

1. Inspect the jaw mating surface for cleanliness. If any foreign material is present, the jaws will not close properly and errors will result.
2. Inspect the batteries to make sure thay are installed with the proper polarity. (Refer to the Battery Installation procedure).
3. Test the batteries. (Refer to the Battery Test procedure.)
4. Verify that the probe leads are connected to the VOLT input of the meter.
5. Verify that the function selection on the meter is correct, i.e., dc mV for dc current or ac mV for ac current.

CALIBRATION PROCEDURE

Required Equipment

The equipment required to calibrate the 80i-410 is listed in Table 2.

Table 2. Required Equipment

INSTRUMENT TYPE	RECOMMENDED MODEL
DC/AC Voltage Calibrator	Fluke Model 5100B
Transconductance Amplifier	Fluke Model 5220A
Digital Multimeter	Fluke Model 8050A
Magnet Wire Coil	15 turns of #10 single film coated copper wire diameter 15" (380 mm) minimum
Small insulated screwdriver	N/A

Calibration Procedure

Use the following procedure to calibrate the 80i-410:

1. Connect the DC/AC Voltage Calibrator output to the Transconductance Amplifier input.
2. Turn both instruments on and allow sufficient warm-up time for stable operation.
3. Connect the 80i-410 to the Digital Multimeter input and perform the Battery Test procedure given under the heading OPERATION in this instruction sheet.
4. Slide the 80i-410 power switch to the ON position.
5. Perform the demagnetizing procedure given under the heading OPERATION in this instruction sheet. Snap the jaws at least three times to ensure the residual magnetism is as low as possible.

   NOTE

   The probe should be at room temperature before proceeding to the next step.

6. Locate the ZERO adjustment in the end of the probe handle (see Figure 4). Use an insulated screwdriver to adjust this control for a multimeter reading as close as possible to 0.0 mV.
7. Set the calibrator and amplifer controls so that the calibrator delivers 8.00V dc to the amplifier and the amplifier drives 8.00A dc in the 15-turn coil.
8. Clamp the jaws of the probe around the coil. Adjust the position of the probe so that the coil passes through the center of the jaw opening.
9. Locate the GAIN adjustment control in the end of the probe handle (see Figure 4). Use an insulated screwdriver to adjust this control for a multimeter reading as close as possible to 120.00 mV dc.
10. Set the calibrator and amplifier controls so that the calibrator delivers 8.00V ac at 60 Hz to the amplifier, and the amplifier drives 8.00A ac in the 15-turn coil.
11. Set the multimeter function switch to ac.
12. Verify that the multimeter reading falls between 115.00 and 125.00 mV ac.

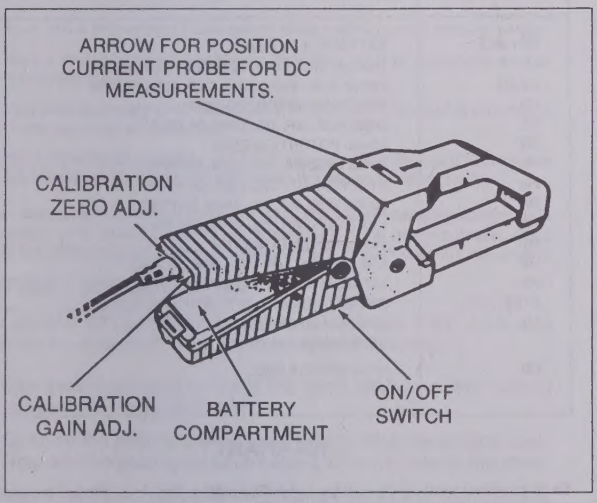
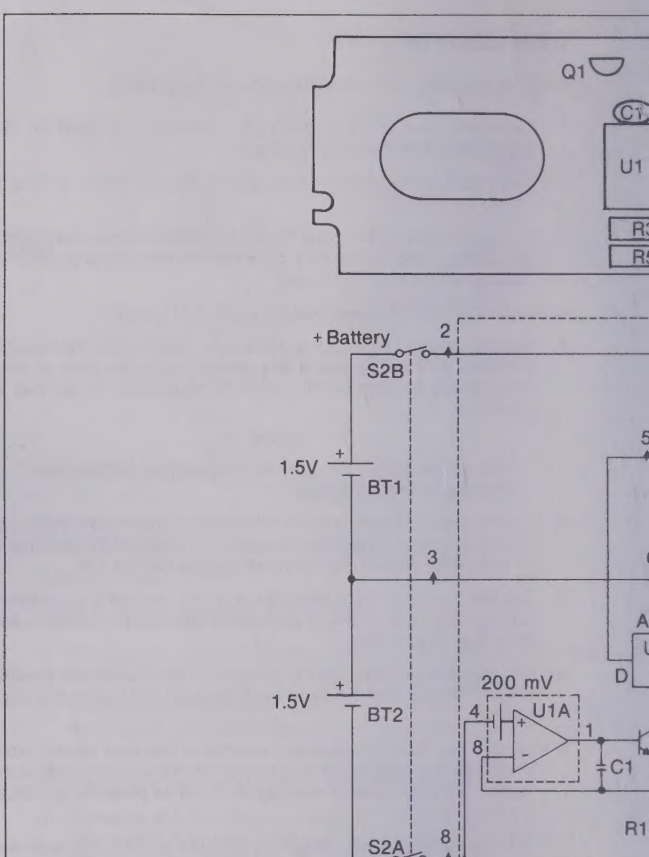


Figure 4.

CLEANING AND STORAGE

Clean the mating surfaces of the core at regular intervals. Apply a light coating of dripless oil to prevent corrosion. If the probe will not be used for periods longer than 60 days, the batteries should be removed and stored separately.



Replaceable Parts

REFERENCE DESIGNATOR	DESCRIPTION
BT1,BT2	BATTERY, 1.5V AAA
C1	1000 pF CAP, 160V, 10% CER, GEB605 FS
C2,C3	220 pF CAP, 500V, 10%, CER, GEB 605 FS
Q1	NPN TRANSISTOR, BC 237 B
R1	200Ω RES, MF, 1%, 1/8W, 50 PPM
R2	10 kΩ, POTENTIOMETER
R3	59 kΩ RES, MF, 1%, 1/8W, 50 PPM
R4	1 MΩ RES, MF, 1%, 1/8W, 50 PPM
R5	59 kΩ, RES, MF, 1%, 1/8W, 50 PPM
R6	1 MΩ, RES, MF, 1%, 1/8W, 50 PPM
R7	10 kΩ, POTENTIOMETER
R8	4.02 kΩ, RES, MF, 1%, 1/8W, 50 PPM
R9	137 kΩ, RES, MF, 1%, 1/8W, 50 PPM
S1201,202	SWITCH, BIPOLAR (2 POSITIONS) SLS 220
U1	LINEAR AMPLIFIER + VOLTAGE REFERENCE LM 10 CLN 8
U2	HALL EFFECT CELL

WARRANTY

Each product manufactured by John Fluke Mfg. Co., Inc. (Fluke) is warranted to be free from defects in material and workmanship under normal use and service. This warranty begins on the date of shipment and extends only to the original Buyer (or end-user who purchases through a Fluke authorized reseller of the product) for the period specified on the warranty document furnished with each product. This warranty does not apply to fuses, batteries or any product which, in Fluke's opinion, has been misused, altered, neglected or damaged by accident or abnormal conditions of operation or handling.

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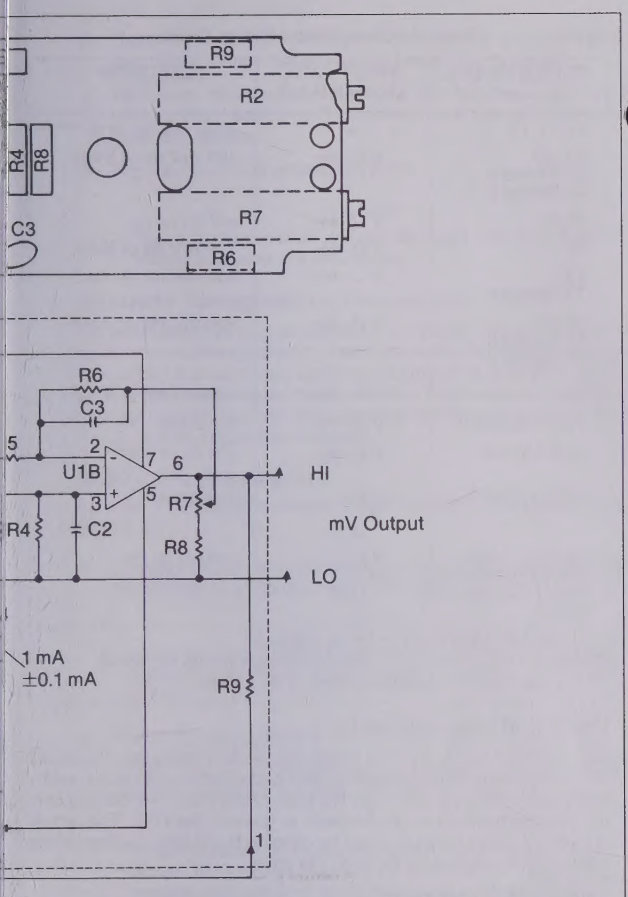

To obtain warranty service, contact your nearest Fluke Service Center or send the product, with a description of the difficulty, postage and insurance prepaid (FOB Destination), to the nearest Fluke Service Center. Fluke assumes no risk for damage in transit. At its option, Fluke will repair or replace the defective product free of charge or refund the purchase price. Following warranty repair, the product will be returned to Buyer, transportation prepaid (FOB Destination). If Fluke determines that the failure was caused by misuse, alteration, accident or abnormal condition of operation or handling, before commencing the work, Fluke will provide an estimate of repair costs. Following repair, the product will be returned to the Buyer transportation prepaid and the Buyer will be billed for the repair and return transportation charges (FOB shipping Point).

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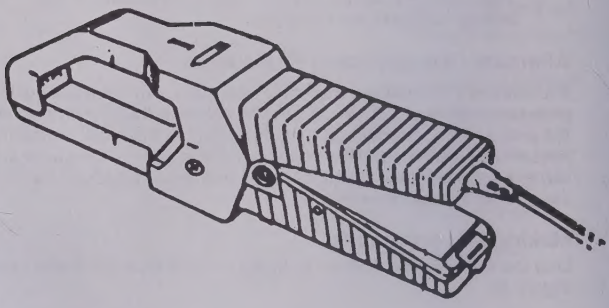

INTRODUCTION

The Fluke 80i-410 DC/AC Current Probe is a battery-powered clamp-on current probe that is used with a voltmeter to measure dc or ac currents up to 400 amps. Each jaw of the probe contains half of a magnetic core. The jaws clamp around a conductor allowing current measurements without breaking the circuit. A Hall sensor mounted in a gap in the core senses the magnetic field produced by current being measured. An amplifier circuit generates an output signal of 1 mV per amp. Demagnetizing (degaussing) is accomplished by manually snapping the jaws.

SPECIFICATIONS

ELECTRICAL

Specified Current Range: 5 to 400A dc or ac

NOTE

When using this probe with a true-rms meter, the minimum ac current is limited to the low end of the specified ac mV range of the meter. For the following Fluke meters, the minimum current input for specified ac accuracy is as follows:

Fluke 45: 15A
Fluke 87: 20A
8060A/8062A: 10A

Usable Current Range: 2 to 600A dc or ac

Output Signal: 1 mV per amp dc or ac

Accuracy (uncertainty): ± (5% of reading + 2.5A), 5 to 400A, dc to 62 Hz, for 1 year, 18 to 28°C (64 to 82°F), probe demagnetized, conductor centered

Frequency Response: -7% at 400 Hz, -3 dB at 1200 Hz typical

Working Voltage: 660V rms maximum at input

Maximum Conductor Sizes: 1 ea 30 mm (1.18") diameter
2 ea 25 mm (0.98") diameter

Load Impedance: >1 MΩ, 100 pF (The probe's active circuit is capable of driving impedances as low as 1 kΩ (chart recorders etc.). However, the battery test indication will be incorrect (low) if the meter input impedance is less than 1 MΩ.)

GENERAL

Temperature Coefficient: ±(0.1% + .2A) per °C (0 to 18°C, 28 to 50°C)

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